

REMARKS

Claims 1-11 and 14-22 are pending in the application, of which claims 11 and 22 are allowed. Claims 1, 2, 4-10 and 14-21 stand rejected. Claim 3 is objected to as depending on a rejected base claim. Claims 1 and 10 have been amended above to recite additional aspects of Applicants' invention.

REJECTIONS UNDER 35 U.S.C. 102

Claims 1, 2, 4-10 and 14-16, and 21 stand rejected under 35 U.S.C. 102(e) as being anticipated by Hatakeyama (US 6,015,976). The Office Action states that "referring to claim 1, Hatakeyama et al. discloses all the limitations of the claims invention. Hatakeyma et al. discloses a method of manufacturing an optical device including: moving a mask (M) situated between a layer of optical waveguide material (W) to be shaped and a source of etchant ions (212)... See Fig. 80 through Fig. 121, along with their respective portions of the specification.... Referring to ... [claim 14] Hatakeyma et al. discloses a vertically tapered waveguide produced by the method. See the Figures of the reference. Many of the workpieces (W) are vertically tapered.... Referring to... [claim 10], Hatakeyama at et al. discloses the mask (M) reciprocating with respect to the plane of the optical waveguide direction. See Fig. 100 through 106, along with their respective portions of the specification."

Applicant has amended claim 1 to recite that "at least two areas of the optical waveguide material are exposed to variable amounts of etchant ions provided along a selected etching direction to provide an optical waveguide having an optical axis non-parallel to the selected etching direction and having a thickness that varies along the direction of the optical axis." Support for the amendment of claim 1 can be found in Fig. 4(a) of the specification. Applicant has amended claim 10 to recite that "the moving mask is a comb mask comprising teeth and the motion is a reciprocating motion along a direction perpendicular to the direction along which the teeth extend." Support for the amendment of claim 10 can be found in Fig. 7(a) of the specification.

Applicant respectfully notes that the only mention of the term "waveguide" in Hatakeyma is found at column 23, lines 56-64, which refers to Fig. 83D. Applicant

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respectfully suggests that the method for providing the waveguide of Fig. 83D does not disclose Applicant's claimed method is recited in claim 1. Specifically, claim 1 recites the feature of "etchant ions provided along a selected etching direction to provide an optical waveguide having an optical axis non-parallel to the selected etching direction and having a thickness that varies along the direction of the optical axis." For example, as illustrated in one exemplary embodiment of Applicant's invention, the waveguide 9 has an optical axis parallel to the plane of the substrate 3 and perpendicular to the direction of the reactive ion to seven, as illustrated in Fig. 2(d). In contrast, the needle-protrusion/waveguide of Hatakeyama is illustrated as having a vertical optical axis (see Fig. 83D) which is parallel to the direction of etching, as indicated by the arrow in Fig. 83B.

Respecting independent claim 10, Applicant respectfully submits that Hatakeyma fails to disclose at least the claim feature of "reciprocating motion along a direction perpendicular to the direction along which the teeth extend." Hatakeyma clearly discloses in Figs. 102-104 that the direction of motion is parallel to the direction along which the teeth extend (the teeth being the successive cusps in the mask.)

Regarding independent claim 14, Applicant respectfully reiterates that the only a reference to a "waveguide" in Hatakeyma is found at column 23, lines 56-64, which refers to Fig. 83D. The statement in the Office Action that "[m]any of the workpieces (W) are vertically tapered" is insufficient, because the word "workpiece" is not synonymous with "waveguide". Not all workpieces are waveguides. In fact the only structure in Hatakeyama denoted a "waveguide" is the one shown in Fig. 83D. For a particular structure to constitute a waveguide, both the structural dimensions and the refractive indices of the waveguide core and surrounding material must satisfy certain optical properties to permit one or more waveguide modes to be supported in the waveguide. It cannot be inferred that the workpieces of Hatakeyama form waveguides absent a clear disclosure provided in the reference itself to that effect. Moreover, Applicant respectfully submits that Figs. 83A-83D of Hatakeyama, and the associated text, fail to disclose the features recited in independent claim 14. Specifically, Applicant respectfully submits that Hatakeyma fails to disclose "a) forming a waveguide; b) disposing a movable mask above the waveguide; c) moving the mask along the

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waveguide while exposing the waveguide to an ion etching process, so that a vertical taper is formed in the waveguide”, as recited in independent claim 14.

For the above reasons, Hatakeyma fails to disclose each and every element recited in independent claims 1, 10 , and 14. Accordingly, Applicant respectfully requests to the rejection of independent claims 1, 10 , and 14, as well as claims 2, 4-9, 15, 16, and 21 which depend respectively therefrom, be withdrawn.

REJECTIONS UNDER 35 U.S.C. 103(a)

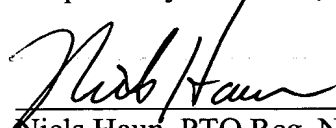
Claims 17-20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Hatakeyama. However, claims 17-20 depend, directly or indirectly, from claim 14. Thus, claims are patentable for at least the reasons provided above regarding claim 14. Accordingly, Applicant respectfully requests that the rejections of claims 17-20 be withdrawn.

ALLOWABLE SUBJECT MATTER

Applicant notes with appreciation the indication that claim 3 would be allowable if rewritten in independent form. However, for the reasons presented above, Applicant respectfully submits that claim 3 is allowable in its present form, depending from claim 1.

In view of the foregoing amendments and remarks, it is believed that the claims in this application are now in condition for allowance. Early and favorable reconsideration is respectfully requested. The Examiner is invited to telephone the undersigned in the event that a telephone interview will advance prosecution of this application.

Respectfully submitted,



Niels Haun, PTO Reg. No. 48,488

DANN DORFMAN HERRELL & SKILLMAN
1601 Market Street, Suite 720
Philadelphia, PA 19103
Phone: (215) 563-4100
Fax: (215) 563-4044